

ATTACHMENT 4 -

TYPE RATING AND DIFFERENCE LEVEL TESTS - PLANNING AND APPLICATION

SECTION 1. Preparation.

1.1. The type rating, difference level definition, and test process are initiated when a manufacturer or modifier presents an aircraft for type certification as a "new type," "derivative" of an existing type, or for a type rating "common" with an existing type. If the manufacturer presents an aircraft as a new type, then type rating and training program requirements are analyzed as previously established, except that T5 is now formally used as the means to set FAR Part 121 required training, checking and currency standards as applicable to that type. For aircraft in which a common type rating is sought, the process described below, primarily using T1, is applied. Special "common type" cases may occur where T2, T3, or T4 are needed. Details of these situations require further amplification and are provided in the AC/Appendix itself. If the manufacturer proposes a derivative aircraft, the following process applies starting with T1. In any event, type rating and crew qualification requirements must be set prior to TC/STC and before an aircraft enters Part 121 service.

1.2. To begin the evaluation process, the manufacturer or modifier identifies models and general variations of models existing in that particular fleet. The model variants are then assigned to logical groups to be described in MDR tables and the FSB report.

1.3. Major differences pertinent to the various models are identified and comparisons are made with the proposed new model. These differences are summarized in a differences document which include appropriate sample operator difference requirements (ODR) tables. Since combinations of all approved model configurations may be numerous, some combinations will never actually be flown, and only typical differences are needed at this stage for test definition, the applicant may select representative ODR for preparation. Similar models are then included in the groups as noted in paragraph 1.2 above for analysis and testing to set the MDR table and FSB requirements.

1.4. Based on the above analysis (including preliminary flight test results or flight simulation estimates if available), the manufacturer proposes probable "difference levels" to be specified in each "cell" of the master difference requirements table for the various model pairs.

1.5. The manufacturer proposes applicable elements of the test process (T1 - T5) and a plan for validation of the intended difference levels. Specific aircraft, times, devices, etc. are identified to conduct the required tests for the pertinent model pairs. Included in the proposal are any necessary interpretations of expected results using advisory circular or established

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practical test standards (PTS). Any special, unique, or additional definitions of successful outcomes are also identified.

1.6. The scope of T1 - T5 is keyed to basic VFR and IFR operations in the NAS. For IFR operations, consideration is given and standard operating procedures apply in cases such as takeoff noise abatement procedures, SIDs, STARs, ILS, VOR, and NDB approaches. Routine "line" situations of inoperative equipment, operations in various types and densities of airspace, adverse weather, etc., are incorporated. However, investigation of special or unique systems or operations such as oceanic navigation in minimum navigation performance specifications (MNPS) airspace, extended range operations (EROP), or category III, are considered only to the extent that crews demonstrate proper basic operation of systems which are integral to the overall operation of the aircraft (e.g., alignment of inertial reference unit (IRU), programming of flight management system (FMS), correct use of the automated flight control system (AFCS) including autoland, interpretation of electronic centralized aircraft monitoring (ECAM), engine indicating and crew alerting system (EICAS), or other types of annunciation, etc.). Any of the above special or unique issues may, when appropriate, be incorporated in MDR tables, footnotes, or ODR example tables when consistent with pretest applicant/FAA agreement. Although MDR/FSB evaluation may not in certain cases specifically include certain differences (e.g., HF radio), individual air carrier ODR's for particular aircraft will identify, evaluate, and address compliance for these items.

1.7. FAA/manufacturer agreement is reached on the grouping of models, proposed tests, test plans, schedules, subjects, and interpretation of possible outcomes.

1.8. Test subjects for all tests except for "extended T3" (if extended T3 is needed) are drawn from the FAA FSB. Subject selection considers the factors such as follows:

- (a) Needed background skills of candidates (previously qualified types);
- (b) General flight experience and currency;
- (c) Test requirements such as location, short notice access, and skills needed for subjects;
- (d) Technical areas, qualifications, or experience that subjects should not have in order to avoid test prejudice;
- (e) Eventual FAA geographic or operator related distribution requirements for ACI, APM, and principal inspector personnel;
- (f) Other special experience as needed for a particular program.

Subject qualifications are addressed at the time of test specification when

test agreement is reached with the applicant.

1.9 Flight Test Branch Coordination. During preparation for testing and evaluation of results, appropriate Aircraft Certification Flight Test Branch coordination is accomplished so that flight characteristics issues and, in particular, special flight characteristics can be suitably identified and addressed.

SECTION 2. Functional Equivalence - Level A or B - TEST 1 (T1)

2.1 T1 is conducted to establish that two variations of the same type aircraft are functionally equivalent and may be assigned difference level A or B. The test is also the first test performed if the manufacturer is seeking a "common type rating." If analysis shows that the differences between aircraft are relatively minor and level B at most can cover difference training, checking, or currency requirements, test T1 is appropriate. If differences are projected to be major, requiring level C, D, or E, T1 may be waived and T2 and T3 directly applied. In this event the FAA must agree to the waiver of T1, and the applicant must agree that the aircraft pair will at least be classed as a level C or higher.

2.2 T1 is typically conducted using two groups of test subjects. Each group is trained in one aircraft, given a "no jeopardy" test to establish a baseline on their primary aircraft, and then they are given a similar "no jeopardy" test on the other aircraft. The symmetry of the test, from a subject sample size and base aircraft qualification point of view, is determined by the particular test to be administered. Symmetry and sample size may vary depending on information already known, expected outcome of the test, criticality of the test, or anticipated need for consideration of that pair of aircraft in the MDR's.

2.3 The test consists of a Part 61, Appendix A type rating flight test or Part 121, Appendix F proficiency check. A subset of FSB members review the candidate test to be administered to be sure it examines critical aspects of the pertinent aircraft pairs. The tests may be administered or observed by more than one FSB member to ensure consistency and uniformity of test procedures and common understanding of subject performance and outcomes.

2.4 For T1 a "safety pilot," serving as first officer for the test, may intervene to prevent damage to the aircraft or to limit maneuvers which endanger safety of flight.

2.5 Test outcomes are documented by maneuver or procedure including successes, problems, and failures.

2.6 Subjects for T1 are chosen from FAA FSB members. Outcomes of T1 are decided by FSB members and are consistent with previously agreed upon criteria.

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2.7 If both groups of subjects clearly pass, the pertinent aircraft pairs may be assigned level A or level B.

2.8 If either group of subjects clearly fail the test, level A or B may not be assigned for that particular aircraft model pair. T2, and if appropriate T3, are then conducted for that pair.

2.9 When T1 is passed a level A or B determination is made. If issues warrant training beyond level A described below, then level B is assigned. The FSB determines the areas of differences training required and specifies necessary devices or training limitations.

2.10 Use of level A is limited to situations where the knowledge requirement is such that understanding and compliance can be assumed to take place. Level A is accordingly limited to situations such as the following:

(a) The change introduces a different version of a system/component for which the flightcrew has already shown the ability to understand and use (e.g., an updated version of an engine);

(b) The change results in minor or no procedural changes and does not result in adverse safety effects if the information is not reviewed or is forgotten (e.g., a different vibration damping engine mount is installed, expect more vibration in descent; logo lights are installed, use is optional);

(c) Information which highlights a difference which once called to the attention of a crew is self-evident, inherently obvious, and easily accommodated (e.g., different location of a communication radio panel, a different EGT limit which is placarded, or changes to non-normal "read and do" procedures).

2.11 Differences which cannot be accommodated by one of the above categories as an upper limit are assigned level B. Typically for level B, the differences information is more complex or it may require a more formal means to assure standardization. Additional considerations for level B may be the need to assure attention, understanding, or emphasis, during training, or retention after training. Level B training is achieved by aided instruction such as use of slide tape presentations, CBT training, or other similar techniques.

SECTION 3. Handling Qualities Comparison - TEST 2 (T2)

3.1 T2 identifies handling quality differences that warrant use of advanced simulation (phase II/III simulators) or aircraft training. It considers needed motion cues, critical visual cues, and significant differences in handling characteristics that potentially affect training, checking, or currency or devices needed in their accomplishment.

3.2 Passing T2 is interpreted as meaning that the "base aircraft" and

"subject aircraft" are sufficiently similar in handling characteristics so that separate aircraft or advanced simulator training, checking, or currency are not needed with respect to handling.

3.3 Failure of T2 means that handling differences are great enough that separate advanced simulation or aircraft training or checking is required for certain pairs of models tested. Accordingly, level E is applied, and the FAA assigns a separate pilot type rating for pertinent models within the fleet.

3.4 A partial test success may result in a requirement that only certain maneuvers be done in the same advanced simulator or the aircraft.

3.5 The procedure for application of T2 is as follows:

- (a) The manufacturer or modifier analyzes design or system differences which could affect handling qualities. A comparison is made of available flight or simulation test data to make a preliminary estimate of the outcome of and need for T2;

- (b) The proposed model is then compared with existing aircraft simulator approval test guides (ATG's) or flight test data, and differences are noted;

- (c) From this list differences which could affect handling characteristics, motion cues or visual cues are identified;

- (d) The resulting handling quality related events, maneuvers, or conditions which could require training, checking, or currency in either an aircraft or simulator are identified.

3.6 If the analysis shows T2 is very unlikely to be failed, then T2 may be incorporated, with FAA agreement, in T3 for purposes of verification that an advanced simulator or aircraft training is not needed to address handling qualities.

3.7 In T2, subjects trained only in their "base aircraft" fly the other aircraft under the supervision of a trained safety pilot. The safety pilot can only provide assistance to the subject pilot in areas unrelated to the handling qualities determination. For example, the safety pilot can remove impediments to progression of the test but cannot fly, coach, or train the subject on any aspect of the test related to handling, vision cues, or motion cues.

3.8 The safety pilot may:

- (a) perform all routine pilot-not-flying (PNF) duties;

- (b) may set up or adjust systems including those normally operated by the pilot-flying (PF) in accordance with pretest agreements;

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- (c) may address or resolve procedural impediments;
- (d) manage and satisfy checklists;
- (e) make normal call outs.

3.9 The safety pilot may not:

- (a) actuate primary flight controls during the evaluation;
- (b) instruct, lead, or coach test subject in any manner;
- (c) describe or interpret instrument indications in a manner which is perceived as coaching.

3.10 Prior training of subjects in the variant under evaluation is not permitted. Subjects will be given a flight check in their "base aircraft" initially to calibrate performance prior to taking the pertinent "check" in the variant being evaluated. Special provisions may be required when primary flight instrument symbology or concepts alone could mask proper evaluation of similarities or differences in handling characteristics.

3.11 The T2 process is the same as described in section 2 above. T2 is typically conducted using two groups of FAA subject pilots. Each group is trained on one aircraft only, given a "no jeopardy" check to establish a baseline on their primary aircraft, and then given a similar "no jeopardy" check in the other aircraft.

3.12 The symmetry of the check from a subject sample size and base aircraft qualification point of view is determined by the particular tasks or maneuvers to be evaluated. Symmetry and sample size may vary depending on information already known, expected outcome of the evaluation, criticality of the task, or anticipated need for consideration of that pair of aircraft in the MDR's.

3.13 The evaluation consists of relevant parts of a Part 61, Appendix A, type rating flight check or Part 121, Appendix F proficiency check. A subset of FSB members review the required maneuvers to be evaluated to be sure they examine critical handling quality aspects of the pertinent aircraft pairs. Subject pilots will be evaluated on performance of required maneuvers consistent with practical test standards (PTS), as well as a qualitative assessment of ease or difficulty of performance of maneuvers compared with the base aircraft. A comparison to the base aircraft will be made for each required maneuver. Subject pilots for T2 are selected from FSB members.

3.14 The evaluation is observed by more than one FSB member to ensure consistency and uniformity of procedure and assessment of outcomes.

3.15 If T2 is failed, level E applies, and flight training must be conducted in the aircraft, a different advanced simulator, or an advanced simulator that

can model the handling and systems of each respective model. With a T2 failure, the next step in the testing process is T5, to validate level E program requirements and training footprints. T3 is not appropriate, and levels C or D may not be assigned.

4.1 T3 is a systems differences test which has multiple functions. T3 identifies master difference requirements (MDR's) at C and D levels, validates training profiles, methods, devices, and checking necessary or appropriate at level C or D. In certain critical failure cases T3 can lead to assignment of level E and a separate type rating (see paragraph 4.10). T3 is used only when the equivalent handling test (T2) has been successfully completed or when T2 is being incorporated as part of T3. T3 (and similar T5) is fundamentally different than T1 and T2 in that proposed or typical training is permitted prior to conducting the test. Training is based on methods, times, devices, and footprints to be designated as the minimum when later specified in the MDR table. In T1 and T2, training is not appropriate or permitted, but in T3 training is integral to the test. T3 training footprints should provide for adequate training, considering typical experience of Part 121 crews, and need not compensate for or assume air carrier entry level skills. Conversely, T3 training should not require unusual or extraordinary skills or efforts of subjects to augment or compensate for minimum training in order to pass T3.

4.2 T3 is a two-part test consisting of:

(a) A Part 61, Appendix A ATPC type rating check; Part 121, Appendix F proficiency check; partial proficiency check; or proposed system check administered to subjects in the test aircraft. The check is administered assuming currency in the base aircraft and completion of the proposed training in the differences aircraft. If a full check is proposed, the tests are similar to those used for T1 or T2 as described in section 2 above. If a partial check is used, the process is similar, but the test items are determined by the FSB considering or based on manufacturer and/or air carrier proposals.

(b) A line oriented flying (LOF) test is then conducted to verify that the difference aircraft can be safely operated in a line environment and to evaluate application of the proposed training and checking in typical line scenarios and operations. The LOF may focus on special situations particular to certain model pairs, verification of overall adequacy of training or checking, the potential of negative transfer from one model to another, or unique fleet related issues.

4.2.1 LOF may also consider scenarios where crews potentially could make subtle or inadvertent errors that could place either the base or difference aircraft in jeopardy. For this analysis or evaluation, recall as well as less time dependent written procedures are considered.

4.2.2 In developing and selecting scenarios for evaluation the following are considered: likelihood of occurrence, possible consequences, and opportunity

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for crew discovery and correction are considered.

4.2.3 LOF may be done in an aircraft, in a simulator, or both per pretest agreement. LOF in some instances may require actual demonstration of mixed fleet flying by alternating between base and differences aircraft.

4.2.4 The LOF portion of the test may be used to evaluate complex issues or issues that cannot be fully detailed in a brief flight check since a check only samples crew knowledge and skills in a limited and highly structured environment. LOF is an integral part of T3 and must be successfully completed prior to "initial" assignment of difference levels (extended T3, if used, need only be completed prior to final level approval).

4.4 As in T1 and T2, subjects for T3 are chosen from the FAA FSB. Following completion of LOF and setting of the initial MDR's at the time of TC/STC, an extended T3 process may be proposed. This is done to get additional line experience and level verification. If an extended T3 phase is used, certain non-FAA pilots (from the manufacturer or air carriers) may be included in order to get a larger statistical sample for assessing training, checking, or currency levels and device effectiveness. When non-FAA personnel are included as subjects in an extended T3 process, the FAA and applicant must agree on subject group composition before the test. Checks in the extended T3 process are administered by FAA FSB members. Non-FAA pilot participation is limited to serving as a subject for extended T3 checks or serving as an extended T3 LOF subject.

4.5 Non-FAA subjects are only included in an extended T3 process following initial approval of differences levels by the FSB and during the period when air carriers implement their individual programs. During this phase FSB representatives observe crew performance during training, administer a sampling of checks, and observe line performance. Information from this phase is considered during the first FSB meeting following TC, usually occurring six months later when final levels are set.

4.6 Outcomes of T3 and extended T3 are decided by FSB members, consistent with previously agreed upon criteria. FAA practical test standards form the basis for T3 evaluation criteria.

4.7 A successful outcome of T3 includes passing all or a previously agreed upon sample of checks and completion of LOF with appropriate crew performance.

4.8 Failure of T3 occurs with either failure of a series of checks or a pre-agreed critical check, or unsatisfactory performance during the LOF portion of the test. In the event of a failure, more comprehensive programs may be proposed and retested within the same level or at a higher training or checking level. Additional devices may be proposed or time increases made to proposed differences level. In the case of retesting, new subjects may be required if program effectiveness cannot be established with subjects who already have been partially trained at the failed level.

4.9 When the test outcome is satisfactory, the FSB sets the minimum difference level at level C or D as appropriate. Documentation for the difference level specified may include training objectives, methods, minimum devices considered acceptable, times, training footprints, checks or currency constraints.

4.10 During T3 level D tests, certain critical situations, problems, or failures may require assignment of level E rather than level D. Assignment of level E may be required in the event of:

(a) T3 experience or difficulties which show the need for assignment of training levels approaching typical initial/transition levels, or

(b) T3 crew performance which indicates that devices or methods associated with level D are not adequate to achieve training or checking objectives, or

(c) repeated failures of attempts to pass test 3 at level D.

4.10.1 Repeated failure at level D refers to failures of T3 due to one or more subject's inadequate knowledge, skill, or ability due to variant differences or the limited success of training programs or devices, rather than individual subject failure due to sub-par or atypical personal performance. Sequential increases of training times, footprints, or other program requirements due to failures, to a value approaching typical initial or transition qualification levels, or marginal or uncertain performance of subjects following programs proposed at or slightly less than initial/transition levels may also require level E. Values slightly less than or approaching typical initial transition levels are decided before T3 starts, on a case by case basis, using some appropriate criteria or measure suited to the applicant's proposed program (academic subjects, maneuvers, times, simulator periods, student behavioral objectives (SBO), crew performance objectives (CPO), etc.). In cases of marginal performance or where test failures show the need for training using a high fidelity environment (phase II/III simulation) to attain program objectives, then the FSB may assign level E.

4.11 The threshold for assignment of level E in the above situations depends on the nature of the failure or limitations encountered in T3 and is not keyed or triggered by a checking or currency requirement alone. Contingencies related to paragraph 4.10 above should be assessed by the applicant and agreement reached on appropriate interpretation of possible failures prior to T3.

SECTION 5. Currency Validation - TEST 4 (T4) - (Done as needed.)

5.1 Currency requirements are conservatively set by the FSB using best judgement based on T1, T2, or T3 outcomes. In the context of the AC appendix,

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currency addresses both the regulatory requirements referenced in Part 121 and extends the currency concept to include difference level specification of particular currency needed between variant aircraft. Currency limits of times, cycles, flights, legs, or other parameters may be set by the FSB for systems, procedures, or maneuvers.

5.2 Further various means to assure currency are permitted including operators recording and tracking individual crewmember performance of the currency items, construction of bid lines to assure that each crewmember operates each variant within specified times, or the recording and tracking of events which implicitly assure performance of the particular currency item.

5.3 In the event that the manufacturer or air carriers desire that less conservative currency requirements apply, T4 tests may be conducted. These tests may be done prior to Part 121 service. In the event tests cannot be done before TC/STC, the aircraft may enter service using the FSB conservative limits until results on T4 establish that less conservative currency requirements can apply.

5.4 After the aircraft enters service, the currency requirements are also validated by enroute inspection and may be adjusted by the FSB on the recommendation of principal inspectors.

5.5 Typical criteria used by the FSB to set level B, C, D, or E currency for initial FSB determinations include the following:

- (a) Complex flight critical systems affecting control or navigation (EFIS, FSM, FGCS) - three segments/30 days;

- (b) Critical normal maneuvers differing between variants (takeoffs/landings) - three cycles/90 days;

- (c) Critical non-normal maneuvers differing between variants (V1 cut, emergency descent) - one acceptable demonstration/training or checking event (typically six months but demonstration period may also vary by crew position);

- (d) Secondary systems (oxygen, APU) - one cycle/12 months.

5.5.1 At level E a specification is made for acceptable methods of compliance with Part 121 takeoff and landing currency.

SECTION 6. Initial or Transition Training/Checking Program Validation - Test 5 (T5) - (Applicable to a new aircraft type or to a derivative aircraft when level E is assigned).

6.1 When a new aircraft type is introduced or major handling differences are found as a result of a prospective derivative aircraft failing T2, T5 is required. T5 is analogous to T3 but is used to define training and checking

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requirements for level E rather than levels C or D.

6.2 The manufacturer develops a training program to qualify and check crewmembers in the level E new or derivative aircraft. Subjects are trained, given flight checks per Part 61, Appendix A, and complete LOF in a process similar to the one described in section 4.

6.3 LOF evaluations address pertinent factors as those described in section 4 of this attachment.

6.4 When an aircraft is assigned level E as a result of a failure of T3 at level D, credit for documentation, testing and previously identified requirements may be made so that T5 need not repeat elements of T3. In the event T3 outcomes are not certain, agreement on T3 failure credits for T5 should be made prior to conduct of T3.